Pre-equilibrium Effects

- **Issues**
  - **Surrogate technique relies on "same" compound nucleus**
  - **Parent reaction and "surrogate" reaction will have different PE**
    - » **Neutron reactions have 1p, 2p-1h, 3p-2h,….**
    - » **Surrogates more complex-e.g 0h, 1p-2h,2p-3h,…**
  - **Amount of PE emission will be reaction dependent**
    - » **HOW WELL CAN WE ESTIMATE PE EMISSION?**
      - **Phenomenological exiton models do pretty well**
  - **Residual Ang.Mom. will be reaction dependent?**
    - » **HOW WELL CAN WE ESTIMATE ANG. MOM.?**
      - **Much higher uncertainty**
      - **Quantum approaches may be more useful than semiclassical**
  - **For (n,γ) PE not important, BUT for surrogate PE could be large**
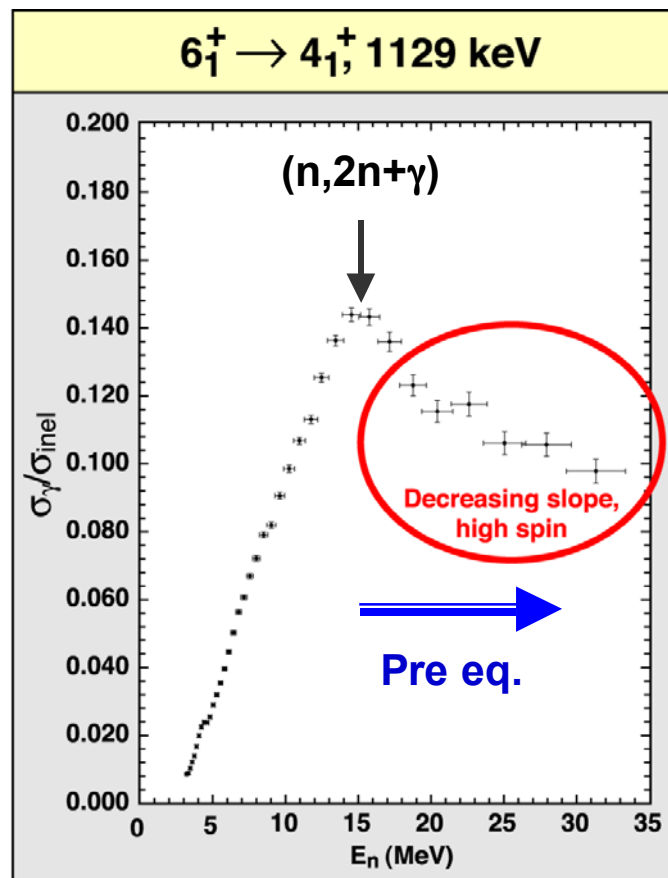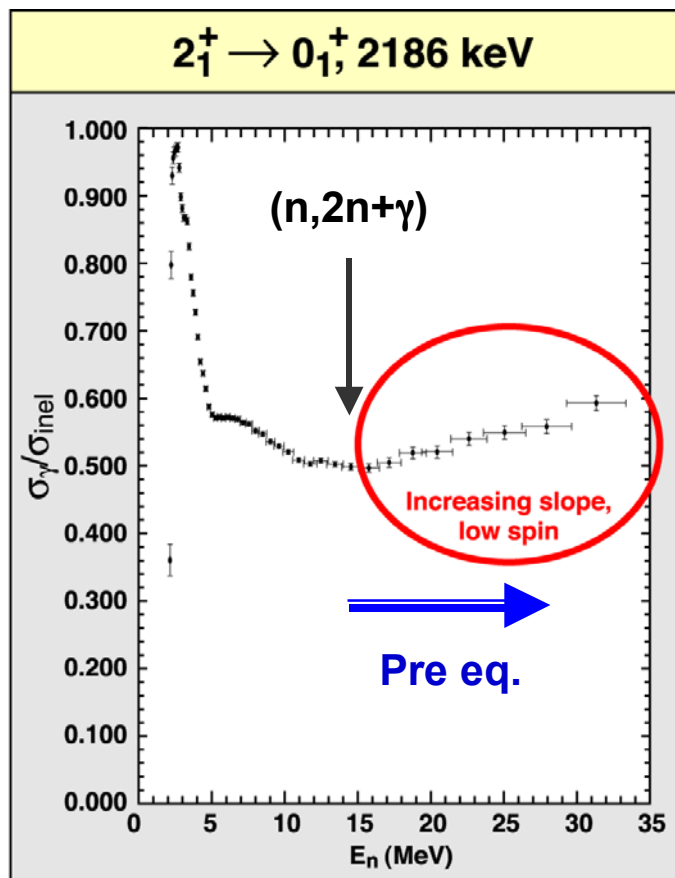
Pre-equilibrium Effects

- **Discussion**
    - **Lively - several active participants**
    - **Use extensive p,p' data - inelastic and ang. Distributions**
    - **Direct reaction data useful - get higher accuracy with coupled channel analysis**
    - **Reaction at 14 MeV different than 50 MeV - look at knock out (quasi-elastic) reactions**
    - **Surrogate studied nuclei may not have well known levels**
    - **Experiments at GANIL on 90Zr - good optical model fits**
    - **Presentation on Kerman-McVoy approach for direct reactions - formal mechanism for initial reaction stage -relevent to Younes/Britt - used with p-γ by Dietrich**
    - **PE ang mom - many approaches: FKK, NWY, TUL, and semiclassical models such as exciton and HMS.**
    - **Exp GEANIE data - 90 Zr**

^{90}Zr(n, n' γ) / ^{90}Zr(n, n')

- Shape (E_n > 14 meV) may reflect spin distribution in residual nucleus
  — GEANIE/WNR can resolve longstanding issues of preequilibrium

Pre-equilibrium Effects

- **Action Items**
  - **Concentrate on 90Zr+n**
    - » **Calculate PE ang mom distribution vs neutron energy**
    - » **Finish analysis of GEANIE data for (n,n') gamma feeding**
    - » **GNASH/STAPRE/EMPIRE gamma emission from calculated PE ang mom distribution**
    - » **Compare against (n,xn)neutron emission spectra at 14, 18 MeV**
    - » **Compare Exp/Model to determine PE ang mom understanding**
    - » **Do similar comparisons with other data sets.**